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ABSTRACT

This four-part report presents the findings of a study conducted by the San Diego Community College District (SDCCD) to assess methods of effecting savings in energy usage at college facilities, to determine curricular areas in which energy-related instruction could be increased, and to examine ways of saving energy through scheduling and transportation policies. Part I describes the energy sources and problems of SDCCD, outlines relevant energy legislation, and details the study's methodology, which involved: (1) an inventory of existing energy-related curricula; (2) interviews with faculty from a cross section of disciplines to determine the energy-related topics discussed in class; and (3) evaluations of the energy efficiency of district-owned facilities. Part II provides an outline of the courses offered in SDCCD's day, evening, and adult programs that provide energy-related instruction and presents recommendations based on the faculty survey for integrating energy-related topics into the remaining curricular areas. Part III summarizes gas and electricity costs incurred annually by SDCCD and examines, for each of its four physical plants, energy efficiency in terms of building design, lighting, and landscaping. The report concludes with recommendations for administrative policies to promote energy conservation, topics for further study, a bibliography of current energy-related works, and a proposal for class scheduling. (JP)

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ENERGY CONSERVATION
IN THE
SAN DIEGO COMMUNITY COLLEGE DISTRICT:
INITIAL STUDY

October 1975

JL 800 581

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SUMMARY
OF
ENERGY CONSERVATION
IN THE
SAN DIEGO COMMUNITY COLLEGE DISTRICT
INITIAL STUDY

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SCOPE OF STUDY

The report, "Energy Conservation in the San Diego Community College District: Initial Study", defines opportunities for the wiser use of energy and suggests curricula in which energy-related topics could be taught.

The report presents a non-technical discussion of the following:

- o Energy audit of the District's four physical plants - Midway Adult Center and City, Mesa and Miramar Colleges;
- o Inventory of District-wide curricula which could provide energy-related instruction; and
- o Recommendations for energy conservation through more efficient use of lighting, energy-related administrative policies, and modified plant operation.

The educational system has been called upon at various times in history to help the nation solve problems related to needs for new technology. The San Diego Community College District has met the needs of the 1970's by providing instruction in environmental technology and awareness, as well as the conservation of energy resources.

However, the role of adult center and college education should be expanded to include the discussion of energy-related topics in not only the traditional fields/disciplines, such as the physical sciences, engineering and design, but in the humanities, social sciences and vocational programs as well.

Table 1, which follows, presents a matrix showing how the instruction of energy-related topics in various fields of study can have far-reaching impacts on society.

Broad Field of Study	Education Impact	Consumer/Environmental Awareness	Life Style Modification	Citizen Action	Energy Research and Development	Energy Products and Technology	Business and Institutional Management and Marketing for Energy Conservation	Environmental Design	Energy Conservation-Related Services and Operation
Social Sciences	X	X	X						X
Humanities	X	X							
Life/Physical Sciences	X			X	X		X	X	
Trades and Vocational				X	X		X	X	
Speech Arts	X	X							
Political Science			X						
Business and Management	X			X		X			X
Design and Engineering	X			X	X	X	X	X	X

Table 1. Curricula and Energy Conservation Matrix

ENERGY-RELATED CURRICULA

An inventory was made of college (day and evening) and adult school curricula to determine those courses which taught, to some degree, energy-related topics.

These courses represent a wide range of departments and are summarized in Table 2 which follows:

DEPARTMENT	COURSE	FACILITY		
		Eve Coll	Day Coll	Adult Div
Architecture and Environmental Design	Environmental Design/Planning	X	X	X
Biology	Conservation of Natural Resources	X		X
	Environment of Man		X	X
	Ecology/Environmental Protection			X
Chemistry	Environmental Chemistry		X	
Foods and Nutrition	Food Preparation			X
Geography	Man and Environmental Problems	X		
	Economic Geography		X	
Home Management	Home Management			X
	Interior Design			X
Health Education	Community Health			
Humanities	Man and His Environment		X	
Journalism	Environmental Impact Report Writing			X
Landscape	Landscape Design I and II		X	
Marine Studies	Marine Resources		X	
Physical Science/ Science	Survey of Physical Science	X	X	
	Control of Man's Environment	X		
	General Science		X	
	Science Seminar		X	
School Food Service	School Quality Food Preparation	X		

Table 2. Energy Conservation Curricula

The District spends approximately 200,000 dollars annually for energy at its four physical plants for day and evening programs (see Table 3 which follows).

FACILITY	ENERGY COSTS (APPROXIMATE) FOR ONE YEAR	
	GAS	ELECTRIC
Midway Center	1,600	7,000
Mesa College	36,000	108,000
City College	10,800	30,500
Miramar College	2,500	11,300

Table 3. Comparative energy costs by school facility for the period of April, 1974 to May, 1975 (from San Diego Gas and Electric Company).

An energy audit including (1) analysis of lighting systems, (2) building, (3) landscape design, (4) plant operation and (5) administrative policy pointed up many opportunities for energy conservation. Table 4 presents a matrix of energy efficiency at four campuses.

A brief summary of recommendations for electrical energy savings includes the following:

Lighting Systems

- o Reduce excessive overlighting in hallways, dressing/locker rooms, gymnasiums and storerooms.
- o Place more control on exterior lights through visual checks and automatic sensors.

Building Design

- o Modify some windows with awnings and exterior shades.
- o Reroute student traffic in some buildings.

Landscape Design

- o Enhance plantings of shrubs and trees to provide shade for some buildings.

Plant Operation

- o Date lamps for optimum replacement.
- o Encourage more efficient classroom lighting and air conditioning procedures.
- o Modify light switches for more individual room control.

Administrative Policy

- o Post class schedules in each room; rescheduling of classes/faculty

work week should be considered

o More control of empty classrooms should be exercised.

o Students and faculty should be made more aware of energy resource conservation.

PLANT	Exterior Lights on During Day	Lighting Timers not Coordinated with Changing Sunlight	Air Conditioned Rooms with Doors Open After Class Hours	Lack of Individual Light Switches and Easily Operated Switch Panels	Excessive Illumination in Hallways, Store Rooms, etc.	Rooms with Lights on and Unoccupied	Classes with Students in Attendance to 1½ Hours Before Class
Midway	X						
Mesa	X	X		X	X	X	X
Miramar	X	X	X		X	X	
City	X	X	X	X	X	X	X

Table 4. Energy Efficiency Matrix

In addition, the District should explore further studies, such as: the use of solar energy for heating school facilities, the construction and application of energy-saving products in vocational instruction, encouraging student intern programs in environmental protection/energy-related fields, and evaluate existing proposals for bicycle pathways for students.

SECTION I
INTRODUCTION

San Diego has not escaped the "energy crises" even though our benign climate and diverse, nearby recreation and relatively moderate unemployment has enabled us to enjoy a high standard of living with few of the energy-related problems experienced in other parts of the country.

If past energy consumption trends continue, the per capita use of all forms of energy will double by 1985. The major portion of this increase will result from rising electricity use, currently being consumed at the rate of 2-1/2 times more than other forms of energy. (La Rosa, et al.)

The realization that resources are limited and not as resistant to man's imposed changes as we expected is part of the "environmental ethic" of the 1970's. This enlightened approach to use of resources of environmental ethic has led (in 1974) to Assembly Bill 1575, which requires environmental impact reports (mandated by the California Environmental Quality Act of 1970) to consider energy requirements of proposed development projects. (For a discussion of energy legislation, consult Table 1.)

As consumption increases, problems can be anticipated. Nationally, potential long-range problems include: oil and natural gas which furnish most of our energy are finite and irreplaceable in our lifetime; costs of imported oil have increased over four times; higher costs of energy have depressed the economy, worsening inflation; and up to ten years may be required to develop domestic energy supplies which can have severe environmental consequences in mountain and offshore environments.

(Schmertz, 1975) ENERGY AND THE SAN DIEGO REGION

The energy sources for the production of electricity used in the San Diego Region include gasoline, piped gas, diesel, jet and aviation fuels, liquid propane, oil and nuclear power shown in Figure 1. San Diego imports over 99 percent of its energy resources (no mining of fuels takes place in the region).

TABLE 1

ENERGY LEGISLATION AFFECTING CITIES

Public Resources Code
Chapter 276, Statutes
of 1974
(AB 1575)

This law is a comprehensive planning mechanism, requiring EIR's to consider energy requirements of proposed private and public projects. It also requires review of the General Plan and response to the Energy Resources Conservation and Development Commission in terms of energy use. When the new Commission is established, it will have responsibility for implementing SB 277 and SB 144.

Health and Safety Code
Chapter 1136, Statutes
of 1972
(SB 277)

This law affects residential construction, particularly with regard for requirements for insulation. It will require revision of the Building Code.

Health and Safety Code
Chapter 13, Statutes
of 1974
(SB 144)

This law affects non-residential building standards. It is more comprehensive than SB 277, in that it requires that an energy conservation manual be prepared for use by local enforcement and requires revision of the Building Code.

Health and Safety Code
Chapter 1214, Statutes
of 1973
(SB 510)

This law affects industrialized housing and mobile homes, incorporating the same basic regulations with regard to insulation and other construction standards as SB 277 and 144. It will also require changes in the Building Code.

Public Resources Code
Chapter 1411, Statutes
of 1974
(SB 1521)

This law requires manufacturers of appliances to utilize an intermittent ignition device as a replacement for gas pilot lights within twelve months after one is developed.

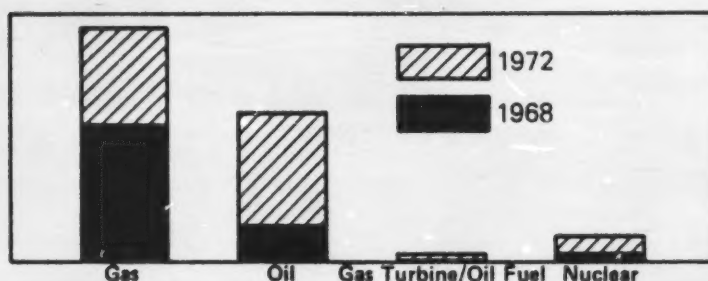


Figure 1. Electrical Energy Produced by Type of Fuel (from State of the Environment Report).

Energy consumption is essential to our well being (energy is used in the processing of foods, medicines, etc.) and high standard of living. However, the production of fuels and their use has many ramifications. Locally, electricity production creates air pollution emissions, and construction of power plants and transmission lines to accommodate increased usage can adversely affect the environment.

REPORT PURPOSE

This report presents an initial study of the opportunities in which the San Diego Community College District can:

- o more wisely use energy resources in the current operation and maintenance of its four plants - Mesa College, City College, Midway Adult and Mira Mesa campuses;
- o increase the instruction/discussion of energy-related topics in the classroom and provide leadership in the American educational system; and
- o effect energy savings through policies regarding student/faculty transportation and classroom scheduling.

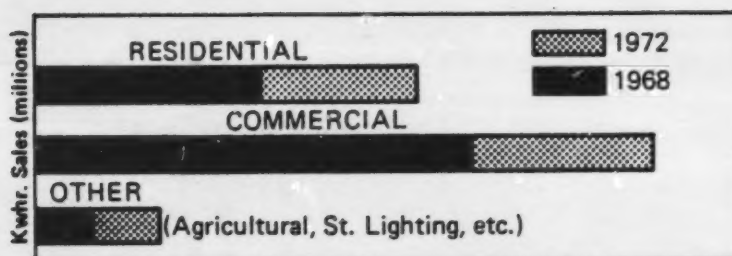


Figure 2. Electricity Energy Uses (from State of the Environment Report).

A portion of increases in energy consumption will result from rising electricity use. Since 1968, electric energy use in the region has increased by 52 percent, and over 100 percent in the past ten years generally in the commercial (including institutions) sector (Figure 2).

Costs of electricity are rising steeply, primarily because fuels such as natural gas and low-sulphur fuel oil are more costly than they used to be. In San Diego, natural gas is still a primary energy source for the production of electricity, although elsewhere, the use of oil has substantially increased. (La Rosa, et al, 1974)

SCOPE OF WORK

The scope of this initial study includes inventorying existing energy-related curricula through analysis and questionnaire and personal interviews; measuring and evaluating the energy efficiency (energy audit) of district-owned facilities; examining custodial and administrative operations/procedures for energy savings; and recommending procedures, minor redesign, curricula, transportation plans and areas of further study for the wise use of energy and energy resource awareness.

The Energy Conservation Committee (La Rosa, Sorman and Roach) understands that this study is a first, important effort to define problem areas in the use of energy and suggest opportunities for energy conservation. Implementation of any of the study findings including recommended curricula, administrative policy and maintenance procedures will be promulgated only after more detailed investigations and evaluation.

The most basic energy-related problems faced by the San Diego Community College District are:

1. increasing environmental awareness in the school system to create a long-term impact on energy conservation;

2. providing instruction in energy technology (as well as other environmental sciences) to meet the needs and challenges of the future; and
3. implementing a dynamic, comprehensive energy conservation program at its four physical plants.

For the benefit of the reader, the report has been divided into major discussions including Curricula, Facilities and Student-Faculty-Administration. Each Section includes technical tables and recommendations.

The recommendations represent only the findings and judgement of the principal investigator and consultants. Where possible, recommendations are documented for their practicality, cost-effectiveness or adherence to Federal Energy Administration policy.

Finally, it is hoped this initial study will, after necessary review and evaluation, be incorporated into a District policy and action program, as well as becoming a guide to specific areas that should be investigated, now and in the future.

SECTION II

CURRICULA

THE ROLE OF EDUCATION IN ENERGY CONSERVATION

The results of a recent poll on environmental attitudes revealed that, although all respondents were in general agreement, employment takes priority over environmental protection; those with college educations held significantly different views. Educated respondents favored expenditures, legislation and taxation to protect the environment. (Anonymous, 1975) This example is but one impact of education on our understanding of the environment.

The educational system has been called upon at various times in history to help the nation solve problems related to needs for new technology. Educational institutions are needed to help with the tasks of instructing the region's students in energy technology and energy conservation. (Baird, 1975)

The San Diego Community College District currently provides instruction in environmental technology and awareness, as well as conservation of energy resources. However, much of the college and adult education curricula touch upon topics that have some relation to energy -- from production to consumption. Therefore, the role of education should be expanded to include some discussion of energy conservation in courses of study not usually associated with environmental protection and management, such as, sociology, philosophy, public administration, vocational trades, etc.

ENERGY-RELATED CURRICULA: INVENTORY

An inventory was made of college (day and evening) and adult centers curricula to determine those courses which taught, to some degree, energy-related topics. These courses represent a wide range of departments and are discussed in Table 2.

In addition, courses were identified (Table 3) for their relevance (however slight) to energy conservation-related topics.

In order to illustrate how energy-related topics could be introduced into existing curricula, an example is offered. Table 4, Physical Science Course Outline, presents unit topics, course time and energy conservation topics that could be integrated into the unit's instruction.

TABLE 2

Energy-related curricula (energy conservation stated in course description)

SUBJECT	COURSE	FACILITY		
		Evening College	Day College	Adult Division
Architecture and Environmental Design	A0201.1 Environmental Design/Community Planning and Development			X
Biology	6 Conservation of Natural Resources	X		X
	9 Environment of Man	X		X
	A0420.3 Ecology/Environmental Protection			X
Chemistry	17 Environmental Chemistry		X	
Foods and Nutrition	A1306.2V Food Preparation and Nutrition			X
Geography	7 Man and the Environmental Problem	X		X
	60 Economic Geography		X	
Housing and Home Furnishing	A1333.3V Home Management			X
	A1302.1V Interior Design			X
Health Education	2 Community Health		X	
Humanities	10 Perspectives on Man and his Environment		X	
Journalism	EIR Writing			X
Marine Studies	13 Marine Resources		X	
Nursery and Landscape Technology	38 Landscape Design II	X		
	5a Landscape Design		X	
Physical Science	10 Survey of Physical Science	X	X	
	15 Control of Man's Environment	X	X	
	A1901.11 General Seminar		X	
Science	48 Science Seminar		X	
School Food Service Management	8 School Quantity Food Preparation	X		

TABLE 3

Courses with possible energy topics (energy-related, but conservation not stated in course description).

SUBJECT	COURSE	FACILITY		
		Evening College	Day College	Adult Division
Anthropology	3 Introduction to Social Anthropology	X		
Apprenticeship	A5301.1V Work Experience			X
Architecture	A0202.1V Drafting Architectural Design			X
	5 Architecture Design		X	
	10 Architectural Orientation		X	
Aviation	2 Airport Administration & Services		X	
Banking & Finance	1 Principles of Bank Operation			
Biology	Biological Oceanography		X	
	10 Biology of Human Nutrition		X	
	48a-b Seminar in Biology		X	
Building Construction Technology	26 Residential Kitchen Planning & Remodeling	X		
	2 Construction Practices I-IV		X	
Building Trades	85 Fundamentals of Professional Construction Inspection	X		
	89 City and County Building Codes	X		
Business Management (Law)	12 Office Management	X	X	X
	50 Introduction to Business		X	
Chemistry	17 Environmental Chemistry	X	X	
	25T Earth, Air, Fire, & Water			X
Chicano Studies	11 a-b Community Development		X	
Child Development	18 Program Planning	X		
	12 Supervision and Administration of Nursery Schools		X	
Citizen Services	A2199.12 Consumer Protection & Management			X

TABLE 3 (continued)

SUBJECT	COURSE	FACILITY		
		Evening College	Day College	Adult Division
Civil Engineering	1 Traffic Engineering Fundamentals	X		
	34 Environmental Planning and Land Development	X		
	33 Highway Design, Materials and testing		X	
Custodian	70 Custodial Procedures	X		
	71 Supervising Custodian	X		
Electricity	70 Electric Code	X		
	71 a-b Industrial Electronics for Electricians	X		
	70 Basic Industrial Electronics	X		
Electronics	16 Basic Electronics Theory	X	X	X
	14 Orientation and Survey		X	X
	A0934.1 Electronics Theory			
Food Service Occupations	5 a-b Restaurant Operations and Management	X	X	
Engineering	5 Properties of Materials		X	
	A0940.1V Appliance Repair		X	
Economics	30 Contemporary Economic Problems		X	
Geography	1 Physical Geography	X	X	
	60 Economic Geography			
	30 Geography of California		X	
	40 Geography of San Diego County		X	
Governmental Management	3 Governmental Administration	X		
	7 Governmental Finance	X		
	23 Community Resources	X		
	24 Park Management	X		
	25 Recreation Administration	X		
	26 Public Works Administration	X		
	33 Program and System Evaluation	X		
Health Education	A1214.2/2 Community Health	X	X	X
History	176 History of United States		X	

TABLE 3 (continued)

SUBJECT	COURSE	FACILITY		
		Evening College	Day College	Adult Division
Home Economics	3/5 Food Preparation and Meal Management		X	
	43 Consumer Information		X	
	A1333.3V/45 Interior Design and Home Furnishings		X	X
	46 Interior Environments (See Marketing 37)		X	
	48 Home Economics Workshop		X	X
	17 Advanced Clothing Construction			X
	A1333.12V Household Repair and Maintenance			X
	A1305.12V Family Relation			X
Hotel and Restaurant Operations	23 Introduction to Hotel - Motel Management	X	X	
Industrial Technology	8 Engineering Systems & Procedures		X	
	22 Basic Industrial Materials		X	
Instructional Aid	50 Introduction for Aids		X	
	52/52a-b Development and Use of Instructional Materials		X	
Institutional Housekeeping Management	1 Executive Housekeeping	X		
Journalism	15 Feature Writing	X		
	2 Advanced Reporting and Editing		X	
Library Technology	50 Introduction to Library Services	X		
Machine Shop	40a Introduction to Machine Tool Practice		X	
Manufacturing Technology	21 Gas Turbine Electrical Systems	X		
	33 Introduction to Nuclear Reactors	X		
Marketing	33 Display	X	X	
	36/37 Interior Environments	X	X	
	50 Small Business	X		
	21 Retailing		X	

TABLE 3 (continued)

SUBJECT	COURSES	FACILITY		
		Evening College	Day College	Adult Division
Marine Studies/Technology	10 Marine Environment		X	X
	13 Marine Resources			X
Metrology	1 Introduction to Metrology	X		
Nursery and Landscape Technology	4a/31 Plant Materials	X	X	
	6b/40 Landscape Construction Theory	X	X	
	45 Landscape Estimating	X		
Occupational Safety and Health Technology	76 Introduction to Industrial Hygiene	X		
Optometric Assistant	4 Optometric Procedures		X	
Philosophy	3t/3 Logic	X	X	
	40 Problems in Social Philosophy		X	
	2a-b Introduction to Philosophy		X	
Physical Education	2x/12x Bicycling		X	
Physical Science	A1901.1 Physical Science			X
	16 Physical Oceanography		X	
	A1919.2 Marine Geography			X
Physics	4a Mechanics and Heat	X	X	
	2a-b General Physics		X	
	14-15 Physics for Electronics Technology			
Psychology	32 Women in Contemporary Society	X		
Plastics Technology	1 Introduction to Plastics		X	
	24 Plastics in Construction		X	
Political Science	48 Seminar in Political Science		X	
	2 Government of United States			X
	6 Contemporary American Political Issues			X
Quality Control and Reliability	2 Environmental Quality Control	X		
Real Estate	6/7 Real Estate Economics	X	X	
	18 Environmental Impact of Real Estate Development	X		

TABLE 3 (continued)

SUBJECT	COURSE	FACILITY		
		Evening College	Day College	Adult Division
Recreational Leadership	12 Introduction to Property Management		X	
	33 Theory of Leisure	X	X	
	32 Introduction to Community Recreation		X	
Sociology	35 Camp Leadership		X	
	10 Contemporary Social Problems		X	
	16 Social Psychology of Everyday Life		X	
	45 Topics in Sociology		X	
	1 Principles of Sociology		X	
	A2201.2 Forums			X
	A2201.3 World Affairs Lecture			X
Science/Technical Science	48 Science Seminar		X	
	14/58 Related Technical Science		X	
Supervision	27 Management Planning	X		
Technical Science	14 Related Technical Science	X		
Water and Sewerage	1 Survey of Modern Technology		X	
	7 Water Treatment Plants	X		
Insulation	60 Introduction to Insulation	X		
Women Studies	30 Women's Movement in American Politics		X	
	32 Women in Contemporary Society		X	

TABLE 4

PHYSICAL SCIENCE COURSE OUTLINE

Unit Topics	Time	Energy-Related Topics
GEOLOGY		
Continental Drift		
Sea Floor Spreading		
Paleomagnetism		
Plate Tectonics		
Convection Current Hypothesis		
Isostasy		
Faulting		Geothermal Energy
Folding		
Rock		
Minerals		
Weathering		
Erosion		
Stream Action		
Atmosphere		Air Pollution
Hydrosphere		Water Pollution
ASTRONOMY		
History of Astronomy		
Our Solar System		Solar Energy
Our Galaxy		
Measuring Distances		
H-R Diagram		
Stellar Evolution		Nuclear Fission
The Universe		
Einstein's Theories		
Symmetry		
New Theories		New Energy Sources
CHEMISTRY		
Periodic Table		
Atomic Structure		
Bonding		
Formula		
Formula Wts		
Equations		
Acids and Bases		
Rates of Chemical Reactions		
Activation Energy		
Equilibrium		
Catalysts		
Thermodynamics		
Solutions		
Organic Chemistry		
PHYSICS		
Magnetism		
Electricity		
Light		
Heat		
Machines		Efficiency of the Auto
Properties of Matter		
Nuclear Physics		Atomic Fusion

FACULTY SURVEY

It was hoped that faculty teaching these courses could provide ideas, problems and successes to help the District assess the extent of energy resource conservation and determine if more such instruction was needed. To this end, questionnaire and personal interview questions (see Table 5) were prepared by the Energy Committee. After testing it on a small sample of faculty at three campuses, it was decided to eliminate this approach in favor on an in-depth interview of a small, random sample of instructors from evening colleges and adult schools.

Prepared interview questions were devised to allow the respondents freedom to express themselves. Due to the final exam preparation of the District's faculty, interviews were difficult to schedule in the allotted time during the week of May 26-30. In addition, there were problems in getting the respondents to elaborate on questions, thereby reducing the value of the in-depth interview.

The Energy Committee feels that awareness for energy conservation could become some part of the curricula, where appropriate, within the District.

However, there appear to be three main objectives to be achieved by increasing the instruction of energy-related topics in the curricula:

- o to provide information to students to help them become concerned, knowledgeable citizens for the review of environmental impact reports and proposed energy-related legislation;
- o to instruct students, as consumers, in the wise use of energy and to help them make rational choices in the purchase of energy using/saving products;
- o to prepare students for technical and professional jobs in energy technology and energy management.

TABLE 5

SAN DIEGO COMMUNITY COLLEGE DISTRICT

3375 CAMINO DEL RIO SOUTH, SAN DIEGO, CA. 92108

OFFICE OF
INSTRUCTIONAL AND STUDENT SERVICES

Date:

MEMO

TO:

FROM: William B. Steinberg, Director of Instruction and Student Services
and the Energy Conservation CommitteeSUBJECT: DETERMINATION OF ENERGY-RELATED TOPICS IN THE COMMUNITY COLLEGE
DISTRICT THROUGH QUESTIONNAIRE SURVEY METHOD

Please complete the following questionnaire to the best of your knowledge.

INDICATE WHETHER YOU TEACH ANY OF THE GENERAL TOPICS BELOW			NAME THE COURSE IN WHICH DISCUSSED	INDICATE THE APPROXIMATE NUMBER OF HOURS/SEMESTERS DEVOTED TO ENERGY-RELATED INSTRUCTION
Yes	No	Category		
		CONSUMER (Appliances, heating, transportation)		
		ECONOMICS (Business, pricing, resource depletion, develop- ment)		
		ETHICS (Conservation obsolescence, life style, environmental degradation)		
		HEALTH (Pollution- social & industrial)		
		INSTITUTIONAL (Hosp- ital, restaurant, etc. management)		
		POLITICAL (Energy legislation, inter- est group lobbying environmental decision making)		
		SOCIAL (Land use policies, social effects, impact reporting)		
		TECHNOLOGY (Urban design, energy production/sources, impact analysis)		

Thank you for your cooperation. Please return the questionnaire through school mail.

TABLE 5 (Continued)

INTERVIEW QUESTIONS

(Instructors teaching energy-related topics.)

1. What are some of the sources of information you use for the discussion of energy-related topics such as technology, pollution, social impact and its wise use?

Fed _____ State _____

Local _____ Industry _____

Public Utility _____

2. What are the methods you use in your class (s) for energy instruction?

Guest Speakers _____ Films _____

Models _____ Text Books _____

Other printed material _____

3. Have you noticed a growing concern or increased interest by students for energy-related information?

4. Are you or your colleagues experiencing difficulty in getting information on energy-related topics? Explain.

5. In your opinion, is your preparation and effort spent on energy-related subjects paying off?

6. What kind of assistance would you like from the District to help in the preparation of energy-related classroom teaching materials?

Syllabus _____ Bibliography _____

Technical data _____

Prepared lecture outline _____

Other _____

TABLE 5 (Continued)

INTERVIEW QUESTIONS

(Instructors not actively teaching energy-related topics.)

1. If you were given information on how your course of instruction relates to the wise use of energy resources (give example) would you try to incorporate this information into your class?

Response: Positive _____ Negative _____

2. How do you think students would respond to discussions or lectures on the wise use of energy?

Positive _____ Negative _____

Other _____

3. What kind of assistance would you like from the District to help in the preparation of energy-related classroom materials?

Syllabus _____ Bibliography _____

Technical _____

Other _____

Biological Oceanography _____

RECOMMENDATIONS

1. Instructors presently teaching energy-related topics should be encouraged to keep abreast of current energy-related technology, energy-saving products and current problems/issues.
2. Instructors teaching classes with some potential for energy-related topics should be encouraged to incorporate energy-related instruction/discussion where possible.
3. Sources of pertinent information on energy-related topics should be prepared for the benefit of instructors.
4. All energy-related courses (whether marine resources or sociology) should be cross-referenced under the field of study titled "Environmental Studies" or similar heading.

The following fields of study are recommended for some instruction of energy conservation topics. (Consult Table 3 for a listing of individual courses.)

5. Curricula (major fields) which could improve citizen effectiveness in public participation of governmental decision-making regarding energy conservation:

Anthropology	Business Management
Chicano Studies	Governmental Management
Journalism	Political Science
Real Estate	

6. Studies which could impact life style and consumption of energy and related resources:

Anthropology	Apprenticeship
Banking and Finance	Chicano Studies
Child Development	Citizen Services
Custodial	Food Service Occupation
Geography	Governmental Management
Home Economics	Hotel and Restaurant Operations
Industrial Technology	Journalism
Marketing	Marine Studies
Occupational Safety and Health	Philosophy
Physical Education	Psychology
Recreational Leadership	Real Estate
Supervision	Sociology
	Women's Studies

7. Courses of instruction which could provide technical and professional skills for new energy-related technology and management:

Apprenticeship	Architecture
Aviation	Biology

Building Construction
 Building Trades
 Civil Engineering
 Governmental Management
 Insulation
 Marketing
 Metrology
 Occupational Safety
 Physics
 Quality Control
 Water and Sewerage

Home Economics
 Chemistry
 Electricity
 Industrial Technology
 Manufacturing Technology
 Marine Studies
 Nursery and Landscape
 Physical Science
 Plastics Technology
 Technical Science

The ramifications of a curricula broadened to include energy conservation could be far reaching. Figure 3 presents a matrix of curricula and possible impact upon society.

APPENDIX G

Curricula and Energy Conservation Matrix

Broad Field of Study	Educational Impact	Consumer/Environmental Awareness	Life Style Modification	Citizen Action	Energy Research and Development	Energy Products and Technology	Business and Institutional Management and Marketing for Energy Conservation	Environmental Design	Energy Conservation-Related Services and Operations
Social Sciences	X	X	X						X
Humanities	X	X							
Life/Physical Sciences	X	X	X	X	X		X	X	
Trades and Vocational				X	X		X	X	
Speech Arts	X	X							
Political Science			X						
Business and Management	X			X		X			X
Design and Engineering	X			X	X	X	X	X	X

Figure 3

ENERGY AUDIT

Schools not only provide instruction about energy, they are also extensive users of energy. In the past, school districts spent up to 4 percent of their total operation budgets of fuel and electric utilities. Today, the increase in energy costs amounts to about 7 percent of most school district operation budgets. (Baird, 1975) The San Diego Community College District spends approximately 200,000 dollars annually for energy in its day and evening programs at its four plants. These costs by facilities are shown in Table 6.

FACILITY	ENERGY COSTS (APPROXIMATE) FOR ONE YEAR	
	GAS	ELECTRIC
Midway Center	1,600	7,000
Mesa College	36,000	108,000
City College	10,800	30,500
Miramar College	2,500	11,300

Table 6. Comparative energy costs by school facility for the period of April, 1974 to May, 1975 (from San Diego Gas and Electric Company).

School leaders have made great efforts in conserving energy; but more is needed. The educational system can continue to set an example for its students and the community. Schools alone cannot solve the problems of energy shortage, but they can provide the leadership which will contribute to a solution.

During the initial assessment of the District's four facilities, it was determined that a comprehensive analysis of plant thermal efficiency (the effectiveness of buildings to retain desired temperatures in relation to ambient conditions) was unnecessary for the following reasons: savings in energy consumption could be accomplished through revised standard plant operations; major changes in existing structures were not feasible at this time; obvious temperature problems could be partially mitigated through relatively inexpensive landscape techniques or window treatment; and the late spring season did not produce a significant range of temperatures from which to establish baseline data that would be possible in the summer and winter months. However temperature measurements of structures at the Mesa campus were conducted as part of a study to determine possible redesign of the proposed air conditioning of some campus buildings. (Consult Appendix A for a discussion of building temperatures, consultant selection and design alternatives.)

Although room temperature measurements were made only at Mesa College, this data would be essential in subsequent heating/cooling engineering studies for all plants. Temperature measurements of structures and data on peak electricity/ fuel needs would also be necessary to monitor the effectiveness of window and wall treatment/modification.

However, a light recording meter was used to identify areas in each of the four plants in which lighting could be reduced to save energy. In every instance there was no intent to compromise lighting standards. The study of team sports facilities, including football fields, tennis courts, etc. and analyses of heating/cooling systems (with the exception of Mesa College) were not within the scope of this report.

For the purpose of this study, the energy audit for District facilities was compiled from:

San Diego Gas and Electric Company energy consumption statistics; conservation checklists from various sources; and on-site assessment and analysis of building exteriors, interiors, landscape design and plant operation. (Consult Table 7 for a matrix of plant efficiency.)

ENERGY EFFICIENCY MATRIX

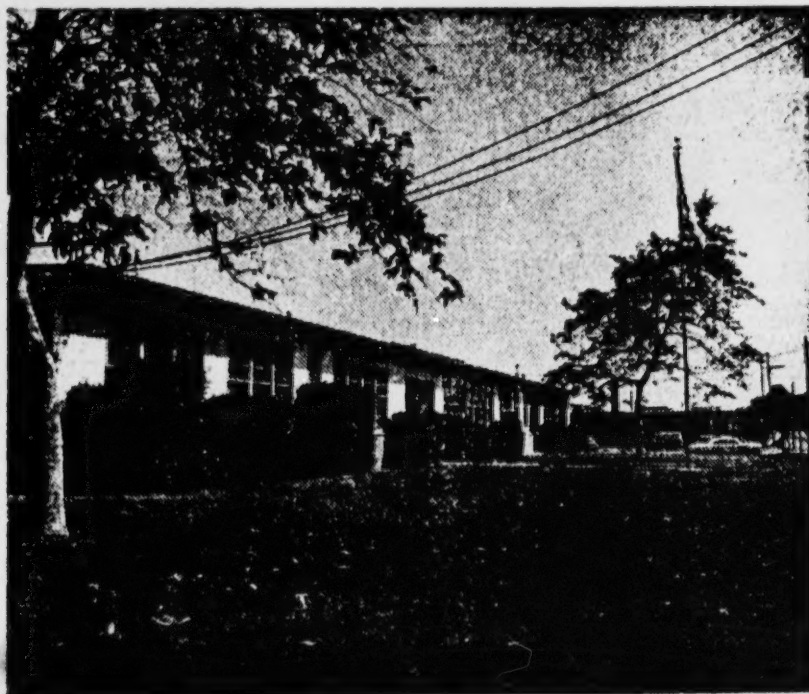
Table 7

PLANT	Exterior Lights on During Day	Lighting Timers not Coordinated with Changing Sunlight	Air Conditioned Rooms with Doors Open After Class Hours	Lack of Individual Light Switches and Easily Operated Switch Panels	Excessive Illumination in Hallways, Store Rooms, etc.	Rooms with Lights on and Unoccupied	Classes with Students in Attendance to 1 & 1/2 Hours Before Class
Midway	X						
Mesa	X	X		X	X	X	X
Miramar	X	X	X		X	X	
City	X	X	X	X	X	X	X

BUILDING PERFORMANCE

Midway Adult School

Located on Fordham Street in Loma Portal, this plant receives the benefit of a maritime climate which alleviates the need for air conditioning.



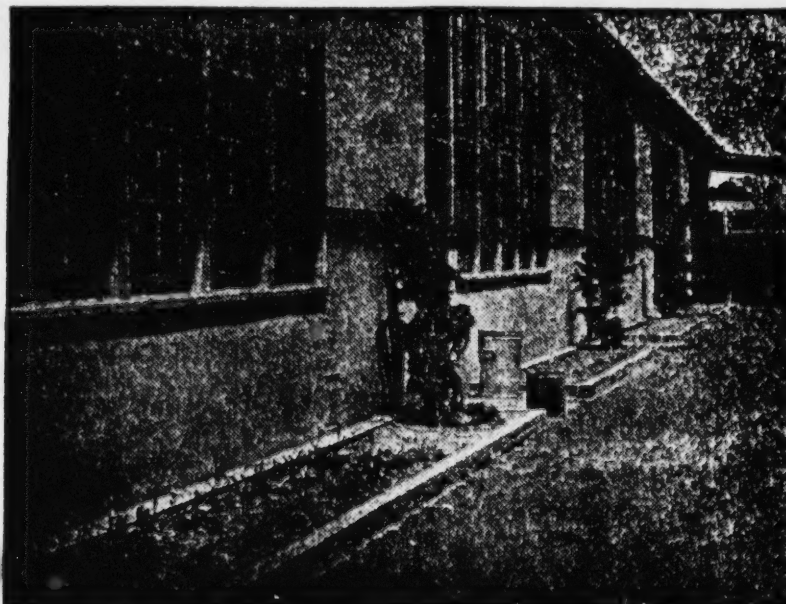
Building Design. Window placement provides for sunlight to augment interior lighting; frequency of cloudy/overcast conditions precludes maximizing sunlight. More recent facilities have overhangs and a window system to take advantage of prevailing winds. These amenities do not exist in older building.

Lighting. School structures and parking lots are efficiently lighted by dual, outdoor lamps mounted on the building trim of classrooms.



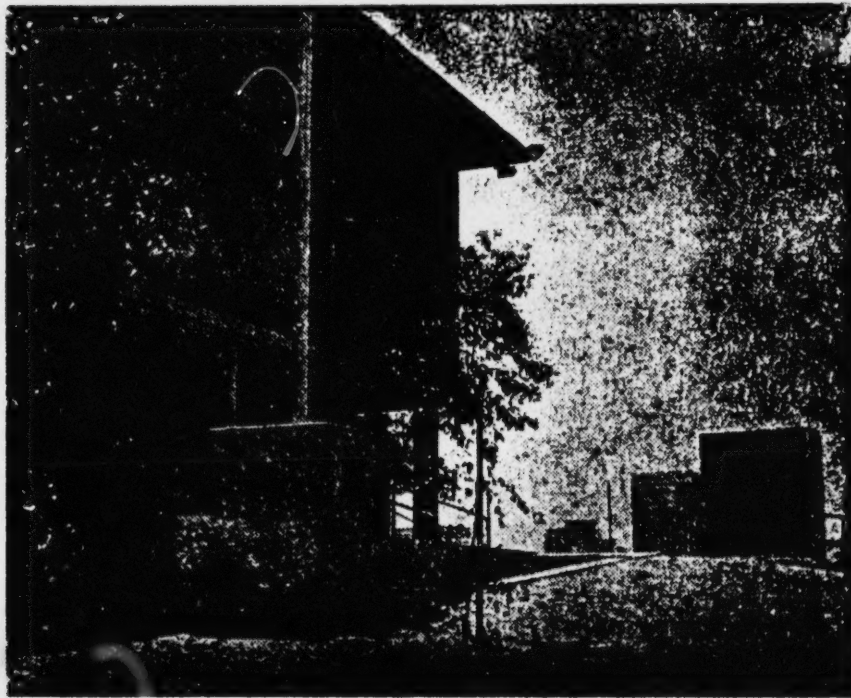
Over 40 exterior lights were unintentionally being turned on during late afternoon. Through the use of a light meter, it was determined that there were no instances of excessive lighting, i.e., lighting systems that provide more light than necessary for safety and/or specific tasks.

Landscape. Existing deciduous trees (leaves drop in fall) are inadequate to provide sunlight - heat - during winter months, and needed shade in summer. Older classroom buildings have brick planting boxes (see photo below) which would lend themselves to the planting of deciduous plant material. as a buffer against direct, summer solar heat.

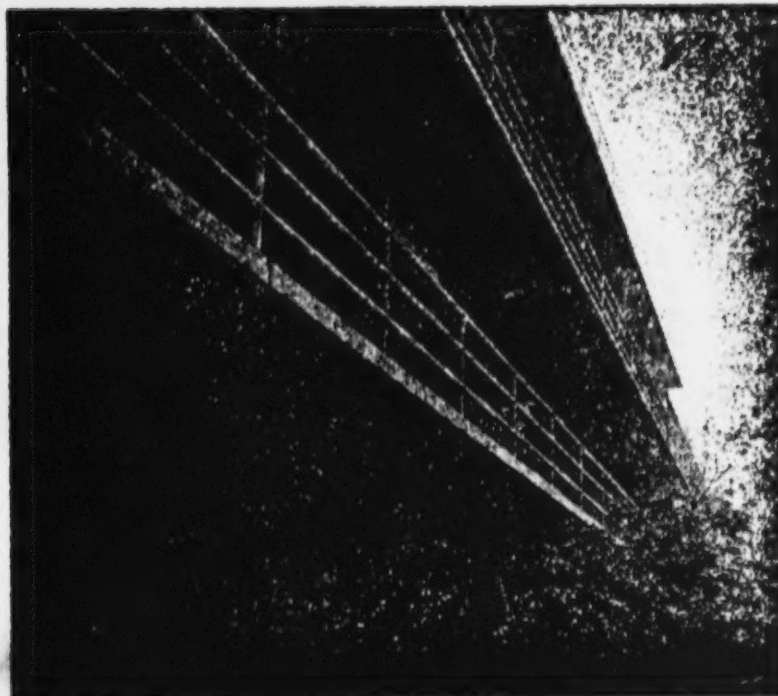


City College

This campus is located on Russ Boulevard, downtown roughly bordered by 10th Street and Broadway. The proximity to the coast is partially negated by multi-story buildings that reduce the impact of coastal breezes.



Building Design. Construction materials consist primarily of concrete and brick - both known to have good insulating capabilities. However, these materials also render ineffective most inexpensive methods to alter the rate of heat loss or gain. The majority of the City Campus facilities have overhangs that provide student walkways and building shade.



An exception to this design are the west-facing windows of Room A-10, computer facilities, which receive intense, afternoon solar heat.

Lighting. Assessment of the lighting system and plant operation indicates many opportunities to reduce energy consumption. Inefficient use of lighting has been identified by building and/or room. Investigations were conducted during afternoons and evenings on two occasions at each campus.

Thatcher Building - exterior lights (6) on during daylight hours. A large woodshop is fully lighted during times (tests and demonstrations) when only 10 percent of the room area is used.

Library Building - outside lights (25) on during day. Hallway lights provide light in excess for safety; readings taken with a light meter measured 75 foot candles, indicating an excess in lighting standards. (Consult Table 8 for a discussion of Federal Illumination Standards.)

SCHOOL FACILITY AREA	FOOT CANDLE LEVEL
Hallways or Corridors	15
Store Shelves	30
Display Areas	50
Patio	5
Bathroom	25
Office	50
General Work Area	35

Table 8. Recommended Lighting Levels (from Federal Energy Administration)

Men's restrooms - are lighted with 7 lamps and provide excess illumination.

Rooms marked "This building is air conditioned, keep door closed" were propped open by trash cans or catch-hinge device.

Conference Room (A-2) - had lights on with no one present.

Room 18 - is heavily used for access to computer services A-10-A, although Room A-10 is the proper entrance. This requires 16 lamps to be on continuously until classes begin at 6:30 p.m.

Creative Arts Building - Hallway lighting is excessive with a measurement of 100 foot candles.

Speech Arts Department - classroom occupied by 1-3 students an hour before class was to begin.

Fine Arts Department - Storage room has excessive lighting (measured 200 foot candles with no individual light switch).

Fine Arts Classrooms - Rooms 112-115 found unoccupied with lights on.

Bulletin Board - is lighted unnecessarily during day, and in evening could be served by two nearby overhead exterior lights.

Building A - Bookstore - unnecessary lighting by six fixtures and 12 lamps in entry area.

Administration - day offices locked after 5 p.m. with only one switch-board operator inside, but all lights (over 50 lamps) on.

Library Building - although air conditioned, entrance is kept open since it is the only access to lower floor facilities. Twenty-five exterior lights were on during the day. The second shift custodial supervisor (Mr. Meshack) explained the school was experiencing mechanical trouble with the clocks as well as that "too many people are setting the clocks." He also explained that some lighting fixtures may be faulty, requiring the frequent lamp replacement.

Student Activities Building - parking lot lights turned on 30 minutes early and five lamps for the sole purpose of illumination landscaping are unnecessary.

Landscaping. The Thatcher Building facilities that face Russ Boulevard receive much of day's solar heat. The Student Activities Building, which is air conditioned, has no large shrubs or trees to screen solar heat.

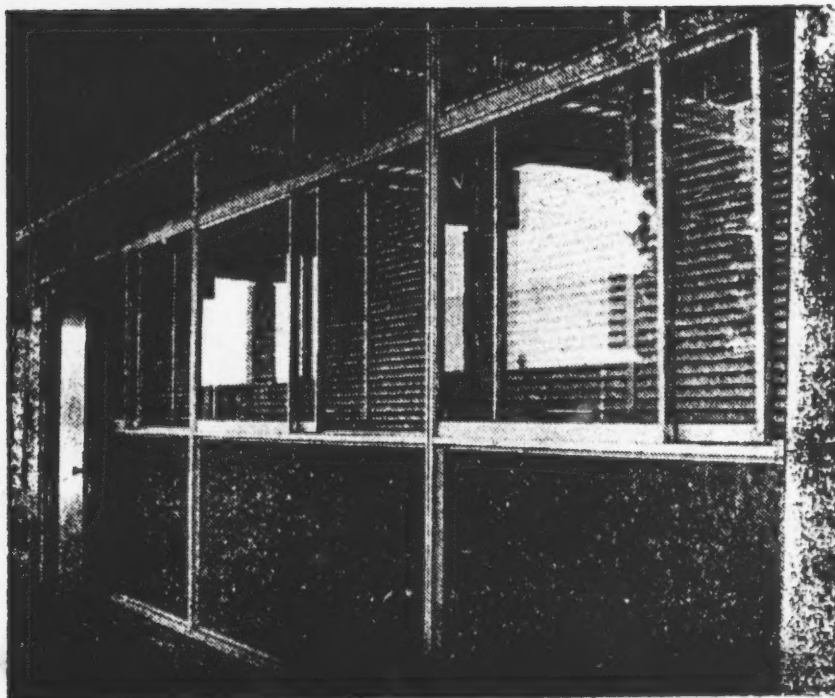
Heating. City College uses a boiler room system, but an assessment of its efficiency is not within the scope of this report.

Mesa College

Due to its location at Kearney Mesa (Mesa College Drive), this campus receives available breezes.

Building Design. Structures have entrances and facades protected by overhangs. Windows with venetian-type blinds can be opened to take advantage of cool, ambient temperatures.





Lighting. Inefficient use of energy is discussed by building and/or room.

Conference and Dining Room (H-117) has exterior lights on during the day.

Coffee Shop (H-108) remains totally lighted in the evening although it is only a day service facility.

Men's Restrooms (K-207, G-120, etc.) lighting measure 60 foot candles indicating an excess of illumination.

Construction technologies (K-2) has nine exterior lights on during the day.

Vending Machine - 4 exterior lights were on during the day.

Book Store - the bank of large windows may provide for a greater use of sunlight for interior lighting.

Library - 5 exterior lights on during hours of sunlight.

Green Room (C-102C) - dressing area has excessive lighting.

Office Occupations (F-102) has a lighting master control switch which needs to be explained to instructors so that lighting can be reduced in unused office areas. Nine exterior lights on during daylight hours.

Room F-210 was unoccupied with all lights on during the day.

Room F-202 (and others) were fully lighted at 5:45 p.m. with one or two students waiting for classes to begin at 7 p.m.

Building G - nine exterior lights on during the day. Faculty office area lights are inadequate resulting in use of individual lamps by instructors.

Building A (Administration - Clerical Lounge (A-105) left unoccupied with all lights on.

Building A (Student Personnel) - Four exterior lights on during daylight hours.

Music Department (C-108) - One faculty office was found to have no switch to control lighting when not needed (a master switch controls most offices).

Parking lot and facility - exterior lights are turned on prematurely in relationship to available sunlight.

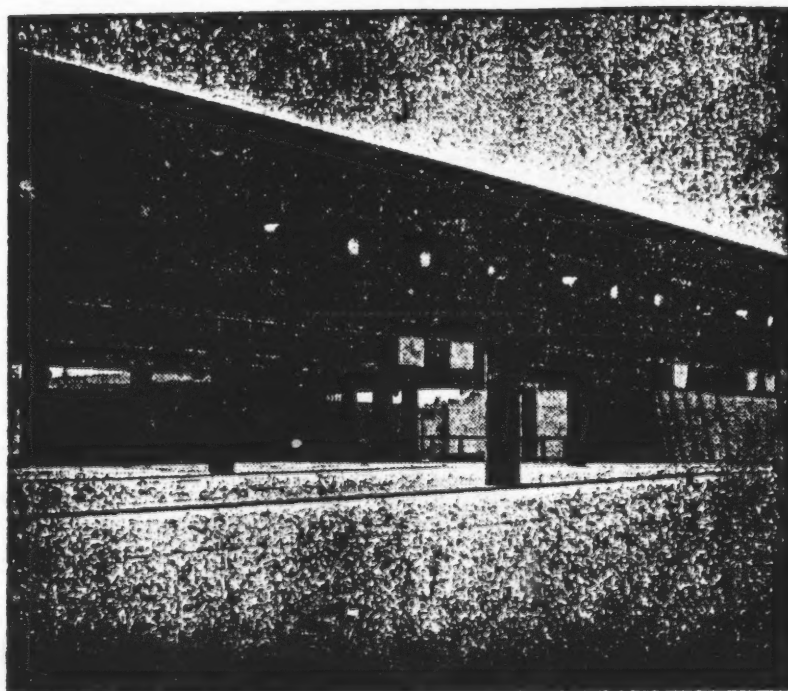
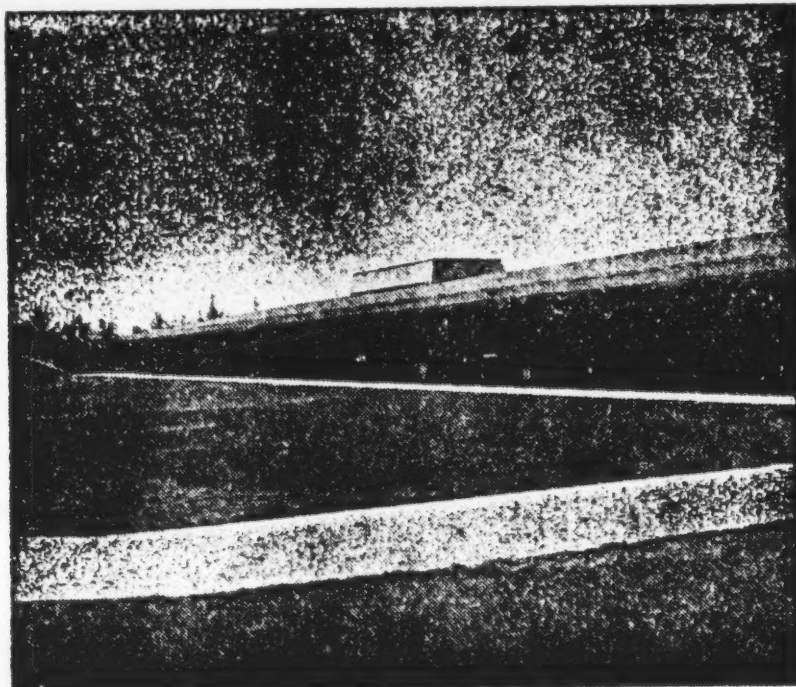
Landscaping. The racquetball facility has no trees in the landscape to screen solar heat.

Heating/Cooling Systems. Temperatures were checked in various Mesa College facilities during April and May with standard (-10 to 110°C) mercury thermometer. In practically all cases temperatures were within two degrees of 70°F.

Rooms with the least efficient use of energy were the air conditioned lecture halls in which the heating-cooling system often malfunctions to produce excessive temperatures (often rooms are too hot or too cold). Since these rooms are air conditioned, there are no means of ventilating the room when the system occasionally breaks down.

Miramar College

Due to its siting near the Naval Air Station, this facility must be heavily sound proofed.



Building Design. Noise suppression standards have required that all rooms be relatively windowless, requiring air conditioning. Instructional facilities such as fire fighting and pistol range require special lighting.

Lighting. Inefficient use of lighting was found in the following facilities:

Room 108 - all lights on while room unoccupied.

Aeronautics - external lights including flood-type lights left on during the day.

Men's Locker - lighting measures 60 foot candles and is excessive.

Gymnasium - unoccupied with all lights on; lighting (50 foot candles) may be excessive.

Fire Science Laboratory - fifteen exterior lights on during daylight hours.

Pistol Range - three outside lights left on during day.

Room B-4 - one exterior light turned on before needed.

Landscaping. Building design precludes use of plants adjacent to structures.

RECOMMENDATIONS

Midway Adult School

1. Deciduous trees should be planted in existing planter areas. Additional trees should be planted in available space along the wing that faces Fordham Street.
2. Interior lights should be turned on only at times of early evening or dusk.

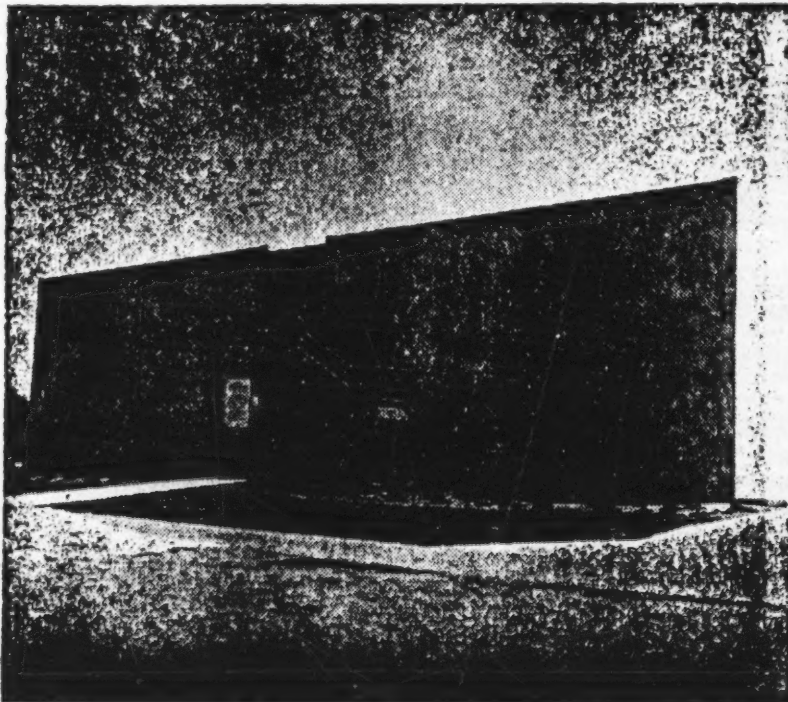
City College

3. Deciduous trees should be planted along the (unlandscaped) north and east sides of the Library Building. The north west wall of the Student Activities Building should be planted to Myoporum and other shrubs.
4. Lamps to illuminate trees (Student Activities Building) and show cases (Creative Arts and Administration) should be reduced by 50% and/or eliminated.
5. Hallways, storage rooms, restrooms and foyers in the Library, Creative Arts and Administration buildings are overlighted; illumination can be reduced from 40 - 60%.
6. Present access through the Library Building to lower classrooms and the Creative Arts Building should be modified to prevent excessive use of energy since all doors must be kept open.

7. Access to the Computer Science Center should be re-routed through the proper door (A-10-A) to avoid a waste of lights and air conditioning. An exterior window screen/awning should be installed at A-10-A to reduce intense afternoon solar heat.
8. Exterior lighting timers should be redesigned for automatic sensors to eliminate its setting by several people and improve efficiency.
9. Exterior building and parking lot lights should be turned on only at early evening or dusk.
10. Master light switch systems should be modified to allow single faculty offices to be lighted when needed.
11. Administration Building light switches should provide for turning off all but those required for the evening division switchboard operator.
12. Large classrooms (drafting and wood shop) should have lighting systems to provide controlled turn-off when not needed, i.e., during tests and demonstrations.

Mesa College

13. Myoporum shrubs and Canary Island pine trees should be planted along the west wall of the Racquetball facility.



14. Illumination in restrooms, gymnasium, "Green Room" dressing area, shower rooms, multi-purpose room, hallways, and the Book Store foyer should be reduced from 10 to 25 percent.
15. Coffee shop (for day students) lighting should be redesigned for major reduction in illumination without compromising security.
16. Music Faculty Office lighting system should be modified for individual office control; all faculty offices should have easily read light switch panels.
17. Exterior lights should be turned on only during early evening or dusk; an automatic sensor should be considered for outdoor lights. A study should be made of potential use of prevailing winds, structure modification and landscape design to assure most effective installation of air conditioning to provide for maximum conservation of energy.

Miramar College

18. Patio, Gymnasium and Locker and Bath Rooms should be reduced in illumination from 40 to 75 percent.
19. Extra-intensity lighting systems for aircraft maintenance instruction should be redesigned for turn-off separate from security/safety lights.
20. Fire Fighting and Pistol Range exterior light switches should be modified for turn-off until needed.

SECTION IV
STUDENT--FACULTY--ADMINISTRATION
RECOMMENDATIONS

ADMINISTRATION

1. A stronger energy ethic should become a part of an administrative policy and action program, including an awareness campaign to faculty, light switch reminders, etc.
2. Deans, curriculum committees and department chairmen should:
 - o formulate energy conservation/instruction policies and action programs; and
 - o follow-up and monitor their implementation; and
 - o consider District faculty for their expertise in the selection of consultants for studies and plans related to energy, as well as landscaping, etc.
3. Custodial supervisors and plant managers should review the findings in this report together with the energy conservation studies. Their input, as well as that from maintenance staff, should be evaluated and incorporated into an action plan coordinated with day and night shifts.

STUDENT-FACULTY

1. A room-use schedule should be posted at each classroom so instructors could turn off lights when there is a period or more between classes.
2. Instructors should have keys to their rooms or give their students explicit instructions to go to the Library or Cafeteria for pre-class studying/discussions. (This could be a solution to students frequently observed entering a classroom from one to two hours prior to the start of the class.)

FURTHER STUDY

The use of solar energy should be analyzed for space heating of future District facilities. The National Science has sponsored four separate research studies in which solar-heat systems have been installed and data collected. Denver Community College (currently under construction) will utilize solar energy for heating and cooling. These studies and programs should be evaluated for application within the District's proposed and completed facilities. (Consult Table 9 for a discussion of publications and studies on energy conservation.)

2. Existing plant boiler room systems should be analyzed for energy conservation potential.
3. The student work experience program should be expanded to include:
 - o apprenticeship in energy-related research and manufacturing industry; and
 - o internship on energy committees and energy planning and management programs within city, county and state governments.
4. The savings in energy through the salvage and recycling of solid waste generated by the District should be studied for an action program.
5. The construction of operating solar panels, space heaters, etc. for actual facilities use, or for training as part of vocational instruction should be considered.
6. Instructors who are now, or could be, teaching energy-related courses should be queried for their ideas and feelings, to improve chances for successful implementation of the energy conservation program.
7. The desirability of District support for bicycle "ways" for student transportation should be considered. (See Table 10 for discussion of a plan for bikeways.) In addition, theft-proof bicycle parking, car pools and dialogue with transportation agencies and mass transit companies should be encouraged and explored.
8. A proposed rescheduling of the faculty workweek and class schedules should be considered for its potential to:
 - o save automobile fuel by students and faculty; and
 - o make more efficient use of facilities.(Consult Appendix A for a discussion of class scheduling.)

TABLE 9

RECENT ENERGY PUBLICATIONS

Partial list of recent energy publications, studies and manufacturers of solar products.

Anonymous, Energy Conservation in Building Design, American Institute of Architects Research Corp.; May 1974.

Anonymous, Evaluating Energy Conservation in the Environmental Impact Assessment Process.

Schoen, Richard, New Energy Technologies for Buildings, University of California, 1975.

Williams, Robert, Energy Conservation Papers, Ford Foundation, 1975.

ENERGY TECHNOLOGY AND RESEARCH

The following are completed and in progress reports sponsored by the National Science Foundation:

"Conservation and Better Utilization of Electric Power by Means of Thermal Energy Storage and Solar Heating, Phase I, Summary Report," University of Pennsylvania, October 1, 1971.

"The Consumption of Electricity in the United States" (in progress), Oak Ridge National Laboratory.

"Conservation and Better Utilization of Electric Power by Means of Thermal Energy Storage and Solar Heating" (in progress), University of Pennsylvania.

"Energy Research Needs, Consumption, Production, Technology, Environment Effects, Policy Issues" (in progress), MIT Environmental Laboratory.

"The Impact of Solar Heating on Electric Utility Generation" (in progress), University of Pennsylvania.

"Solar Heating Systems Analysis" (in progress), University of Pennsylvania.

"Test Facility for Experimental Solar Collectors" (in progress), University of Pennsylvania.

"Thermal Energy Storage Unit for Air Conditioning Systems using Phase Change Material" (in progress), University of Pennsylvania.

"The Value of Thermal Insulation in Residential Construction, Economics and the Conservation of Energy" (in progress), Oak Ridge National Laboratory.

TABLE 9 (continued)

SOLAR ENERGY MANUFACTURERS (CALIFORNIA)

Beasley Industries, San Diego	Solar manufacturer.
Davis Instruments, 857 Thornton, San Leandro 94577	Sells small, portable solar cooker.
Daylin, 9536 Monte Mar Dr., Los Angeles 90035	Solar water heating systems.
Duncan Solar Co., P.O. Box 4923, Stanford 94305	SEIA member.
Energy Systems, Inc. 634 Crest Dr., El Cajon 92021	Solar systems.
Fasio, Red Wood City	
Raypack, West Lake City	
Real Gas & Electric Co., Box A Guerneville 95446	Sells and installs foreign and domestic wind-power plants.
Reynolds Metal Co., 2315 Dominguez St., Torrance 90508	Makes collectors.
Rho Sigma, 5108 Melvin Ave., Tarzana 91356	Makes thermostat to control solar heaters.
Fred Rice Productions, Inc., 6313 Peach Ave., Van Nuys 91401	Manufactures and distributes solar water heater.
Schults Field Enterprises, 11404 Sorrento Valley Road, San Diego 92121	Energy services.
Sencebaugh Wind Electric, P.O. Box 11174 Palo Alto 94306	Sells wind-driven generator plans.
Skyterm Processes and Engineering, 2424 Wilshire Blvd., Los Angeles 90057	Has developed a roof for solar heating and cooling.
Solarway, P.O. Box 217, Redwood Valley 95470	Manufactures components for solar systems.
Fred E. Steward Co., 2626 Seaman Ave., El Monte 91733	Manufactures and sells wind- driven generator of own design.
Suhay Enterprises, 1505 E Windsor Rd., Glendale 91205	Instructions for do-it-yourself small portable solar water heaters.

TABLE 9 (continued)

SOLAR ENERGY MANUFACTURERS (CALIFORNIA)

Sunsource, 9606 Santa Monica Blvd., Beverly Hills 90201	Manufactures foreign collector.
Sunwater, 1112 Pioneer Way, El Cajon 92020	Manufactures, sells solar collectors and solar stills for water purification.
Textron, Inc., Spectrolab Div., 12500 Gladstone, Sylmar 91342 (also located in Providence, N.J.)	Manufactures solar cells, photovoltaic arrays.
Transparent Products, 1727 W Pico Blvd. Los Angeles 90015	Distributes aluminized surface for solar reflectors.
Unit Span Architectural Systems, Inc., 6606 Variel, Canoga Pk. 91303	Builds solar collectors.
Wind Power Systems, San Diego	Wind turbine.
Ying Manufacturing Corp., 1940 W. 144th St., Gardena 90249	Manufactures and sells solar water and space heaters.

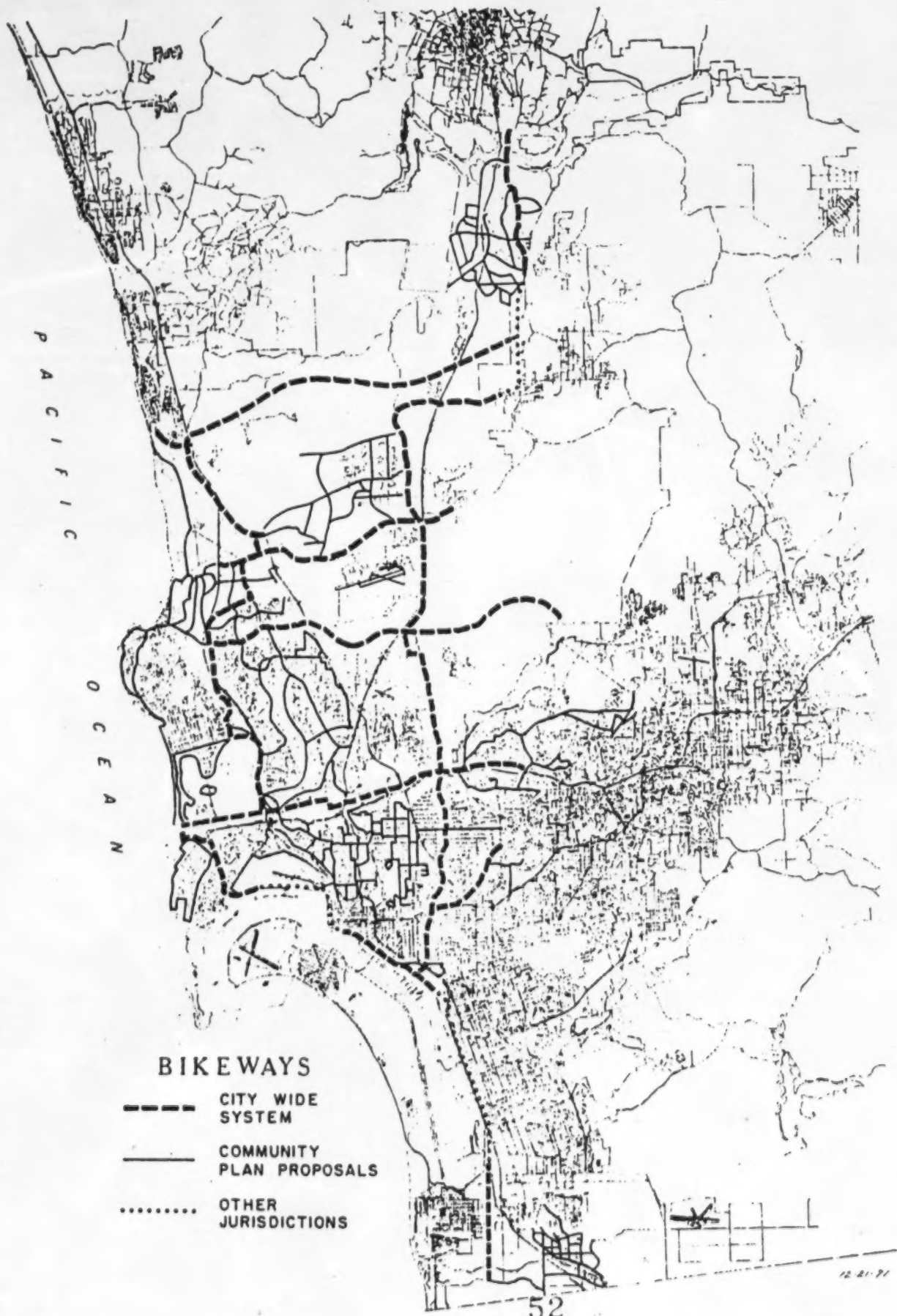


TABLE 10

APPENDIX A

CLASS SCHEDULING PROPOSAL FOR MESA COLLEGE: PILOT PROGRAM

Although this suggestion would not save the District any energy, it could save the students and faculty quite a bit of gas. It would save the District money by making better use of present facilities by at least 20 percent.

Basically, all classes would be based on a 90-minute time block (80 minutes classtime, 10 minutes exchange) and would be offered two days a week. By working out a six-day schedule, classes could be offered Monday, Tuesday; Wednesday, Thursday; Friday, Saturday; or Monday, Thursday; Tuesday, Friday; Wednesday, Saturday. In either case, a student could arrange his schedule to have a two, three, or four day week, depending on courses desired and associated labs. By running the time blocks from 8:00 a.m. through 9:30 or 10:00 p.m., the student, day or night, could have a much more versatile schedule to fit his other commitments. The Physical Science Department at Mesa has experimented with this to some degree. Chemistry has run open labs; that is, the student can come into the laboratory during any free time to perform his experiments, thus opening up more classes to him. In the evening, in order to allow students to come two nights a week, instead of three, the lectures are from 5:30 to 7:00, followed by labs from 7:00 to 10:00. Both have proven very popular with the students.

The advantages of this type of scheduling from the student's point of view:

1. Saving of gasoline by coming fewer days
2. Ease of arranging school schedule with work schedule
3. More flexible scheduling (more courses offered at different times)
4. More actual time spent in class (160 minutes/week compared with 150 minutes/week for 1 hour classes three times a week)

The advantages from the District's point of view:

1. Greater use of present facilities
2. Less crowding of parking lots
3. Greater security (if classes were to run continuously the custodians would work from 10:00 p.m. to 7:00 a.m.)
4. Probably fewer custodians would be needed, since they would not have to wait for rooms to become vacant.

The advantages from the faculty's point of view:

1. A four-day (30 hour) week would result in less gas consumption
2. Less competition for faculty parking spaces
3. More class time with students

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Baird, John, "Education Has Key Role in Overcoming Energy Crisis", Point of View, 1975.

LaRosa, Ronald, et al, State of the Environment Report, County of San Diego, 1974.

Personal communication with Mr. Meshack, Plant Supervisor, City College and Fred Deutsch of Miramar College.

Personal communications with T. Stewart and A. Panton of San Diego Gas and Electric Company.

Schmertz, Herbert, "Toward a National Energy Policy", Mobil Oil Report, 1975.

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